

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
30 March 2006 (30.03.2006)

PCT

(10) International Publication Number  
WO 2006/033472 A1(51) International Patent Classification:  
*H05B 33/12 (2006.01) H05B 33/24 (2006.01)  
H01L 51/50 (2006.01)*

2430036 (JP). KUMAKI, Daisuke. IKEDA, Hisao [JP/JP]; c/o SEMICONDUCTOR ENERGY LABORATORY CO., LTD., 398, Hase, Atsugi-shi, Kanagawa, 2430036 (JP). SAKATA, Junichiro [JP/JP]; c/o SEMICONDUCTOR ENERGY LABORATORY CO., LTD., 398, Hase, Atsugi-shi, Kanagawa, 2430036 (JP).

(21) International Application Number:  
PCT/JP2005/018062(22) International Filing Date:  
22 September 2005 (22.09.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
2004-278520 24 September 2004 (24.09.2004) JP  
2004-316228 29 October 2004 (29.10.2004) JP  
2004-316089 29 October 2004 (29.10.2004) JP

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SI, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): SEMICONDUCTOR ENERGY LABORATORY CO., LTD. [JP/JP]; 398, Hase, Atsugi-shi, Kanagawa, 2430036 (JP).

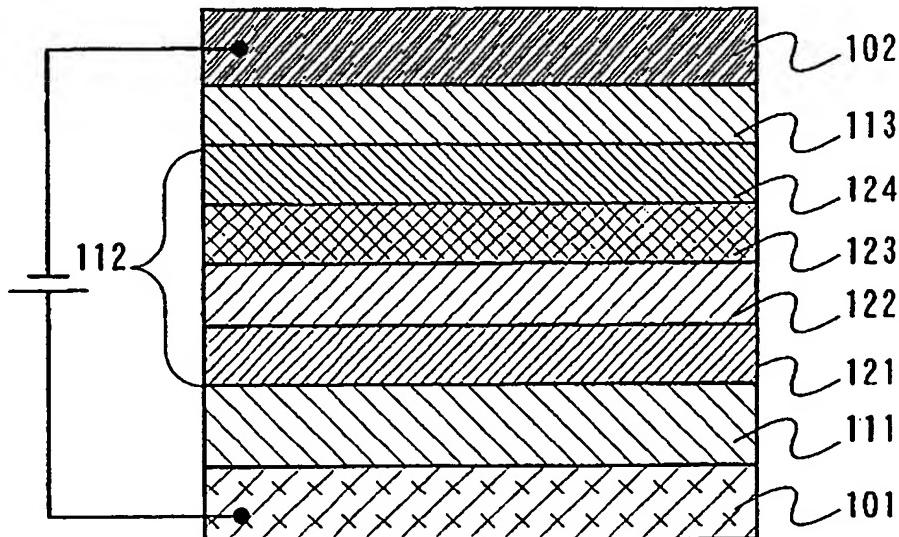
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SEO, Satoshi [JP/JP]; c/o SEMICONDUCTOR ENERGY LABORATORY CO., LTD., 398, Hase, Atsugi-shi, Kanagawa,

*[Continued on next page]*

(54) Title: LIGHT EMITTING DEVICE



(57) Abstract: Light-emitting elements have a problem that their light-extraction efficiency is low due to scattered light or reflected light inside the light-emitting elements. The light-extraction efficiency of the light-emitting elements needs to be enhanced by a new method. According to the present invention, a light-emitting element includes a first layer generating holes, a second layer including a light-emitting layer for each emission color and a third layer generating electrons between an anode and a cathode, and the thickness of the first layer is different depending on each layer including the light-emitting layer for each emission color. A layer in which an organic compound and a metal oxide are mixed is used as the first layer, and thus, the driving voltage is not increased even when the thickness is increased, which is preferable.

WO 2006/033472 A1

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*